CAMILLE BAUER

# SINEAX A 210/A 220
# Multifunctional Power Monitor

**63 measured quantities**
**8 energy meters**
**5 average power values P, Q, S each**

## Application

The A 210/A 220 power measuring instrument is suitable for control panel mounting and measures all the important measurands in 3-phase and single-phase systems.

It displays the measurands with a high contrast 14 mm high LED display. The instrument is also suitable for measurements in high and middle voltage systems because of the freely programmable factors for the current and voltage transformers.

It replaces a large number of analog instruments and delivers high-accuracy values.

The basic execution is an instrument with 2 S0-outputs, which can be programmed as pulse or limit outputs. An extension module extends the functionality and flexibility and supports programming and communication via an RS 232/485 (selectable) interface. It supports data communication with a control system via MODBUS RTU and it can be added without making changes to the basic instrument. Memory and a digital input allow the monitoring and recording of average power values for a minimum of 83 days at 15 min intervals. This function enables the load profile to be determined. Alternatively, the digital input can be used to switch between the high and low tariffs.

## Features

- Measurement of current, voltage, active, reactive and apparent power, active and reactive energy, neutral conductor current, power factor and frequency
- 4 meters for active power: Incoming/outgoing with high/low tariff
- 4 meters for reactive power: Inductive/capacitive with high/low tariff
- 5 values each for active, reactive and apparent power averages with programmable interval times
- Two S0-outputs for pulse or limit values
- Dimensions: SINEAX A 210: 96 x 96 x 46 mm
  SINEAX A 220: 144 x 144 x 46 mm
- Programmable conversion factors
- Flexible power supply with an AC/DC wide-range power supply unit
- Electrically isolated current inputs (1 A or 5 A)
- Upgradeable extension module: RS 232/485 interface (MODBUS RTU), load profile memory, HT/LT switchover, or synchronizing input
- Accurate measured values for U, I ≤ 0.5%, F ≤ 0.02 Hz, others 1%
- Storage of minimum and maximum values
- Measurements in single-phase systems, 3-wire and 4-wire systems in 4 quadrant operation

## Benefits

- High functionality (63 measurand values) in a compact form (depth 46 mm)
- Therefore low costs for purchase, engineering and installation
- Safe 3-way galvanic isolation between all circuits and between the 3 current inputs
- Large LED display that can be read from a distance, especially suitable for badly lit rooms
- Upgradeable extension module allows data storage and communication
- Robust front (IP 66) for tough industrial applications
- Storage of all counter values, the min./max. values, the display mode and the programmed data on failure of the power supply

| Version | Order No. | |
|---|---|---|
| | A 210 | A 220 |
| 500 V / 5 A, power supply 85 to 253 V AC/DC | 149 783 | 152 546 |
| 500 V / 5 A, power supply 20 to 70 V AC/DC | 150 300 | 152 554 |
| 500 V / 5 A, power supply 85 to 253 V AC/DC, with test certificate | 150 318 | 152 562 |
| 500 V / 5 A, power supply 20 to 70 V AC/DC, with test certificate | 150 326 | 152 570 |
| 500 V / 1 A, power supply 85 to 253 V AC/DC | 152 447 | 152 588 |
| 500 V / 1 A, power supply 20 to 70 V AC/DC | 152 702 | 152 736 |
| 500 V / 1 A, power supply 85 to 253 V AC/DC, with test certificate | 152 710 | 152 752 |
| 500 V / 1 A, power supply 20 to 70 V AC/DC, with test certificate | 152 728 | 152 744 |

# SINEAX A 210/A 220
# Multifunctional Power Monitor

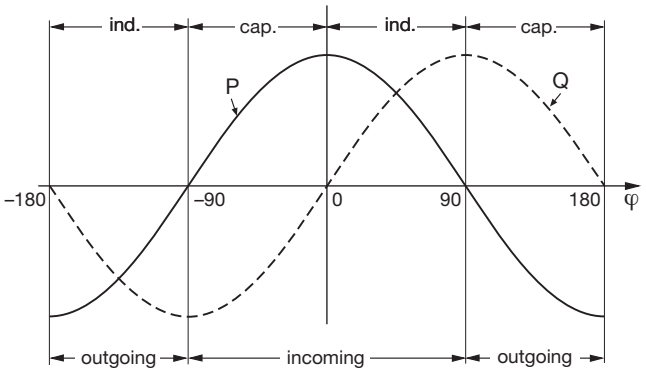
## Function

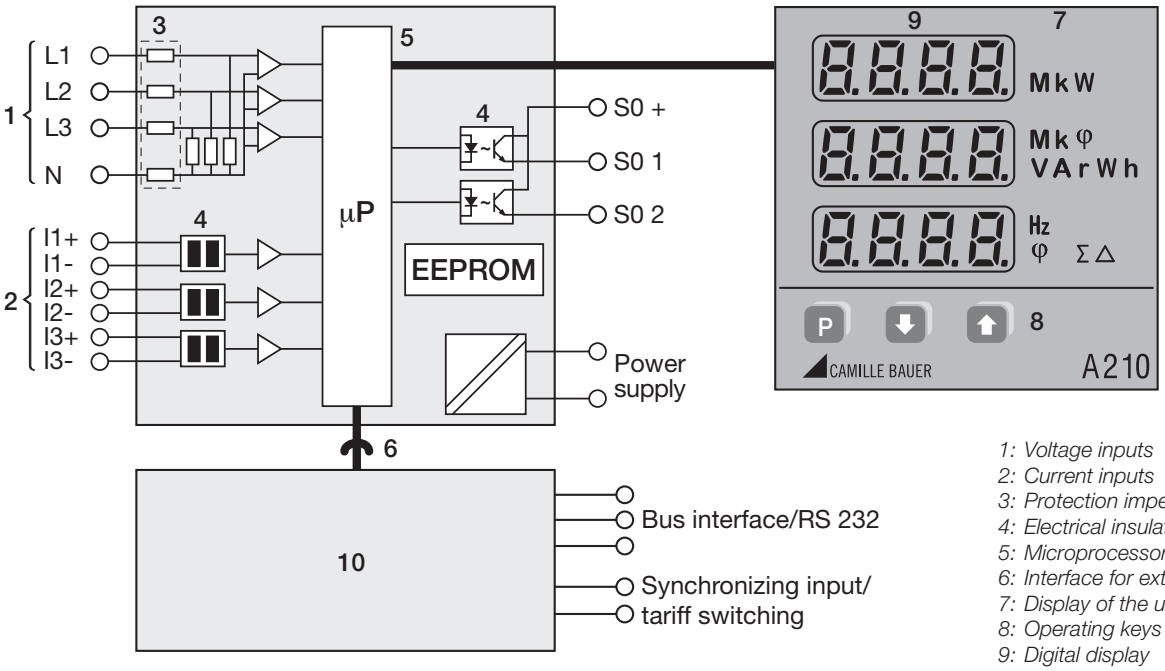
The instrument measures the currents I1, I2, I3 and the voltages U1, U2, U3, the frequency, and the phase angles between the individual currents and voltages. All the other measurands are calculated from these. The measurements are made internally via integrated current transformers. Therefore it is possible to make direct connections without an external transformer.

Each input is sampled 32 times per cycle. This allows measurements to be made including up to the 15th harmonic.

The calculation of the measurands is made in accordance with DIN 40 110 part 1 and part 2, however in 4-quadrant operation.

**In the figures at this data sheet only SINEAX A 210 is shown. Display and operating are identical with the A 220.**




*1: Voltage inputs*
*2: Current inputs*
*3: Protection impedances*
*4: Electrical insulation*
*5: Microprocessor*
*6: Interface for extension module*
*7: Display of the units*
*8: Operating keys*
*9: Digital display*
*10: Extension module MODBUS with data logger*

*Fig. 1. Block diagram.*

## Technical data

### System/application

Single-phase, 3-wire balanced or unbalanced, 4-wire balanced or unbalanced, 4-quadrant operation

### Measurements available

| Measured quantities | Measuring path | max | min |
|---|---|---|---|
| Voltage | 1-N, 2-N, 3-N | • | • |
| Voltage | 1-2, 2-3, 3-1 | • | • |
| Current | 1, 2, 3, N | • | |
| Current $I_{avg}$ (bimetal-15 min/ slave pointer) | 1, 2, 3 | • | |
| Active power P | 1, 2, 3, ∑ | • | |
| Reactive power Q | 1, 2, 3, ∑ | • | |
| Apparent power S | 1, 2, 3, ∑ | • | |

| Measured quantities | Measuring path | max | min |
|---|---|---|---|
| cosφ (4-quadrant display) | 1, 2, 3, ∑ | | |
| cosφ inductive min. | 1, 2, 3 | | • |
| cosφ capacitive min. | 1, 2, 3 | | • |
| Frequency | U, I | | |
| P-meter incoming/outgoing (HT/NT) | ∑ | | |
| Q-meter ind. / cap. (HT / NT) | ∑ | | |
| 5 active power interval values | ∑ | | |
| 5 reactive power interval values | ∑ | | |
| 5 apparent power interval values | ∑ | | |

## Programmable values (basic unit)

Trip points, pulse rate, transformer ratio, type of system, interval time for average power values.

Programming can be locked with a jumper at the back of the instrument.

However, the limit values can still be changed.

All min. and max. values and the counter values can be reset. The resetting of the counter values can also be blocked with the above mentioned jumper.

All the measurands, the selected display, the counter values and the programmed data are kept on a power failure.

## Factory default

| | |
|---|---|
| Brightness: | (mid setting) |
| Limit value / S01: | Off |
| Limit value / S02: | Off |
| Transformer ratio: | 1 : 1 |
| Jumper: | Not in the LOCK position |
| Connecting mode: | 4-wire asymmetric load |
| Synchronizing interval: | 15 min. |

### Applicable regulations and standards

| | |
|---|---|
| IEC 1010 resp. EN 61 010 | Safety regulations for electrical measuring, control and laboratory equipment |
| EN 60 529 | Protection types by case |
| DIN 43 864 | Current interface for the transmission of impulses between impulse encoder counter and tarif meter (S0 output) |
| DIN 40 110 | AC quantities |
| IEC/EN 61326-1 IEC/EN 61326/A1 | Electrical equipment for measurement, control and laboratory use, EMC requirements |
| EN 60 688 | Electrical measuring transducers for converting AC electrical variables into analogue and digital signals |
| IEC 68-2-1/-2/-3/-6/-27 resp. EN 60 068-2-1/-2/-3/-6/-27 | Ambient tests -1 Cold, -2 Dry heat, -3 Damp heat, -6 Vibration, -27 Shock |

## Measuring inputs ⊖►

| | |
|---|---|
| Nominal frequency: | 50, 60 Hz |
| Nominal input voltage: | Phase-phase: 500 V<br>Phase-N: 290 V |
| Nominal input current: | 5 A or 1 A |
| Waveform: | Sine |
| Own consumption: | Current circuit: ≤ $I^2 \cdot 0.01\ \Omega$<br>Voltage circuit: ≤ $\frac{U_{LN}^2}{300\ k\Omega}$ |

### Continuous thermal rating of inputs

10 A at 346 V in single-phase AC system

10 A at 600 V in three-phase system

### Short-time thermal rating of inputs

| Input variable | Number of inputs | Duration of overload | Interval between two overloads |
|---|---|---|---|
| 557 V LN | 10 | 1 s | 10 s |
| 100 A | 10 | 1 s | 100 s |
| 100 A | 5 | 3 s | 5 min. |

### Measuring range

| | |
|---|---|
| U, I, S: | ≤ 120% of nominal value |
| P, Q: | ≤ ± 120% of nominal value |
| F: | 45 to 65 Hz |
| cosφ: | ± 1 |
| Overload indicator: | oL |

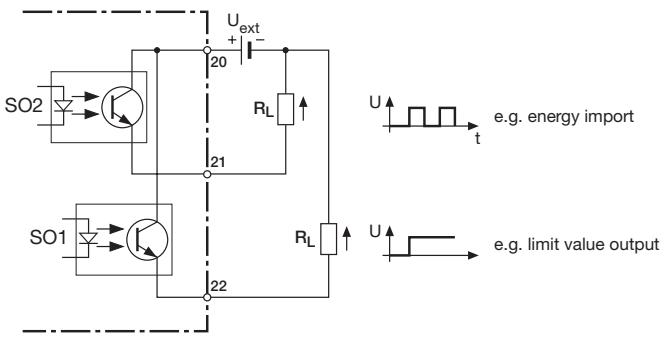
The frequency is measured from the current or voltage. The voltage has priority.

## Pulse/limit value outputs ⊖►

Depending on the function selected, the two digital outputs can be used either as pulse outputs for actual and reactive energy or as limit signals.

The outputs are passive, and are galvanically isolated from all the other circuits by opto-couplers. They are suitable to drive tariff devices (S0-standard DIN 43 864) or 24 V-relais.

| | | |
|---|---|---|
| $U_{ext}$ | ≤ 40 V DC | (OFF: leakage current ≤ 0.1 mA) |
| $I_L$ | ≤ 150 mA | (ON: terminal voltage ≤ 1.2 V) |




### Limit value outputs:

the limits can be associated with any measurand. Depending on the type of connection an OR or an AND function is possible for the following values.

3-wire unbalanced load: $U_{12}/U_{23}/U_{31}$, $I_1/I_2/I_3$, $I_{avg1}/I_{avg2}/I_{avg3}$

4-wire unbalanced load: $U_1/U_2/U_3$, $U_{12}/U_{23}/U_{31}$, $I_1/I_2/I_3$, $I_{avg1}/I_{avg2}/I_{avg3}$, $P_1/P_2/P_3$, $Q_1/Q_2/Q_3$, $S_1/S_2/S_3$, $PF_1/PF_2/PF_3$

| | |
|---|---|
| Alarm ON: | OR function of the phase measurands |
| Alarm OFF: | AND function of the phase measurands |
| Delay time: | Fixed at 1 s (cannot be modified) |

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**Pulse outputs:**

The reactive and active energy can be read out at the pulse outputs in the form of standard S0 pulses for the driving of electronic and electromechanical counting mechanisms.

The pulse rate is programmable:

1 … 5000 Imp./Wh … GWh resp. 1 … 5000 Imp/varh … Gvarh

The duration of the pulses cannot be programmed and also cannot be changed by hardware means.

Pulse duration: > 100 ms

For systems with external transformers, the pulses are for the primary energy data.

## Power supply

DC, AC power pack 45 to 400 Hz
85 to 253 V AC/DC or
20 to 70 V AC/DC

Power consumption: < 4 VA (with interface module)
< 3 VA (without interface module)

## Display

14 mm LED digital display; adjustable brightness

3 digits with sign, frequency: 4 digits, energy: 8 digits

Colour: red

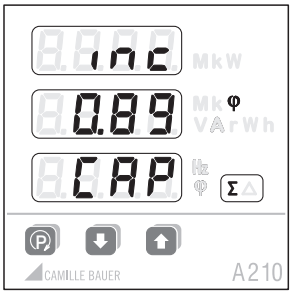
**Zero value suppression**

PF resp. cosφ: Display ---, if Sx < 1% Snenn

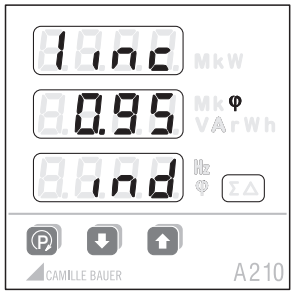
IN: Display 0, if IN < 3% Inenn

Ix: Display 0, if Ix < 1% Inenn

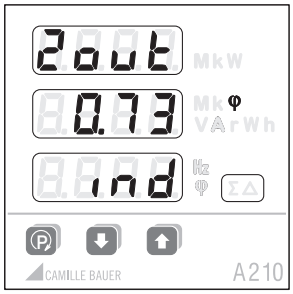
**Example of the display for 4-quadrant measurements**



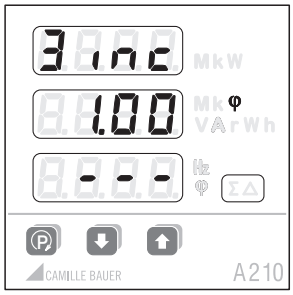

System




Phase 1



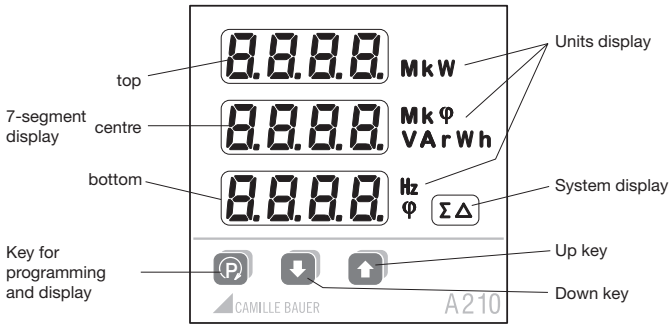

Phase 2




Phase 3

ind inductive
CAP capacitive

inc incoming
out outgoing




Display levels: e.g. 4-wire unbalanced load

| | | a | b | c | d | e | f |
|---|---|---|---|---|---|---|---|
| | 1 | U1<br>U2<br>U3 | $U1_{max.}$<br>$U2_{max.}$<br>$U3_{max.}$ | $U1_{min.}$<br>$U2_{min.}$<br>$U3_{min.}$ | U12<br>U23<br>U31 | $U12_{max.}$<br>$U23_{max.}$<br>$U31_{max.}$ | $U12_{min.}$<br>$U23_{min.}$<br>$U31_{min.}$ |
| | 2 | I1<br>I2<br>I3 | $I1_{max.}$<br>$I2_{max.}$<br>$I3_{max.}$ | $I1_{avg}$<br>$I2_{avg}$<br>$I3_{avg}$ | $I1_{avgmax.}$<br>$I2_{avgmax.}$<br>$I3_{avgmax.}$ | IN | $IN_{max.}$ |
| | 3 | P1<br>P2<br>P3 | $P1_{max.}$<br>$P2_{max.}$<br>$P3_{max.}$ | P | $P_{max.}$ | | |
| ↑ | 4 | Q1<br>Q2<br>Q3 | $Q1_{max.}$<br>$Q2_{max.}$<br>$Q3_{max.}$ | Q | $Q_{max.}$ | | |
| ↓ | 5 | S1<br>S2<br>S3 | $S1_{max.}$<br>$S2_{max.}$<br>$S3_{max.}$ | S | $S_{max.}$ | | |
| | 6 | PF1 | PF2 | PF3 | PF | $PF_{minind}$ | $PF_{mincap}$ |
| | 7 | F | | | | | |
| | 8 | EP inc HT [1] | EP inc LT [2] | EP out HT [1] | EP out LT [2] | | |
| | 9 | EQ ind HT [1] | EQ ind LT [2] | EQ cap HT [1] | EQ cap LT [2] | | |
| | 10 | P<br>Q<br>PF | P<br>S<br>F | | | | |
| | 11 | Pint0 | Pint1 | Pint2 | Pint3 | Pint4 | |
| | 12 | Qint0 | Qint1 | Qint2 | Qint3 | Qint4 | |
| | 13 | Sint0 | Sint1 | Sint2 | Sint3 | Sint4 | |

[1] HT = High tariff [2] LT = Low tariff

## Safety

| | |
|---|---|
| Protection class: | II |
| Overvoltage category: | III |
| Pollution degree: | 2 |
| Enclosure protection: | Front: IP 66<br>Terminals and housing: IP 20 |
| Insulation test (versus earth): | 300 V |
| Surge test: | 4.25 kV; 1.2/30 µs |

Test voltage:

The voltage inputs are fitted with protection impedances. (Circuits for double isolation in accordance with EN 61 010 6.5.3). After this the basic isolation is sufficient (2.2 kV AC).

Power supply ↔ input I, output and housing: 3.7 kV AC

Input I ↔ other circuits and housing: 3.7 kV AC

Input I ↔ input I: 2.2 kV AC

Inputs, outputs and power supply are electrically isolated. The current inputs are electrically isolated from each other.

### Accuracy data

**Reference conditions acc. to IEC 688 resp. EN 60 688**

Sine 50 - 60 Hz, 15 - 30°C, application group II

**Measurement accuracy** (related to nominal value)

| | |
|---|---|
| Current, voltage | ± 0.5% |
| Power | ± 1.0% |
| Power factor | ± 1.0% |
| Energy | ± 1.0% |
| Frequency | ± 0.02 Hz (abs.) |

### Mechanic

| | | |
|---|---|---|
| Dimensions | A 210: | 96 x 96 x 46 mm;<br>Panel cutout<br>$92^{+0,8}$ x $92^{+0,8}$ mm |
| | A 220: | 144 x 144 x 46 mm;<br>Panel cutout<br>$138^{+1}$ x $138^{+1}$ mm |

**Terminals:**

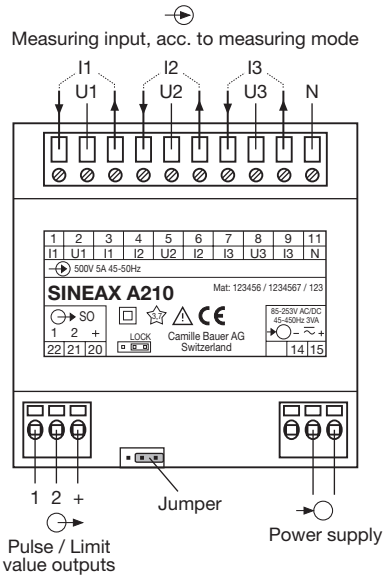
| | |
|---|---|
| Inputs | Screw terminals<br>Wire gauge single wire: 0.5 - 2.5 mm²<br>Wire gauge fine wire: 0.5 - 1.5 mm² |
| Power supply, outputs | Clamps<br>Wire gauge single and fine wire:<br>0.5 - 1.5 mm² |
| Housing material: | Flammability class UL 94 HB |
| Weight: | 250 g at A 210 resp.<br>300 g at A 220 |
| Mounting: | For control panel mounting |

### Environmental conditions

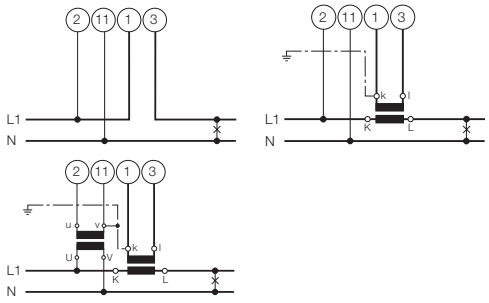
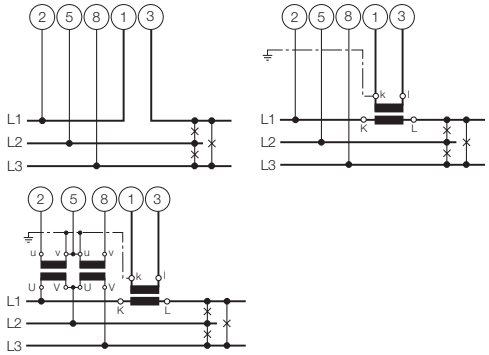
| | |
|---|---|
| Operating temperature: | – 10 to + 55 °C |
| Storage temperature: | – 25 to + 70 °C |
| Humidity relative: | ≤ 75% |
| Altitude: | 2000 m max. |

Indoor use statement

## Electrical connections



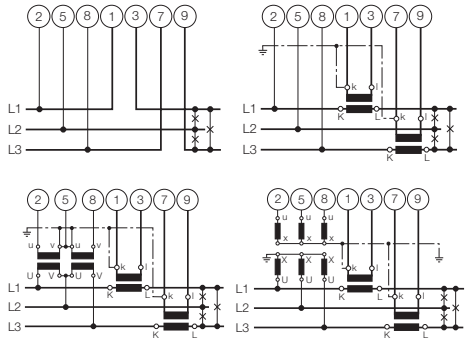
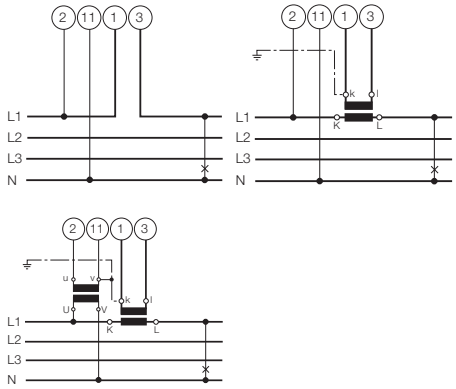
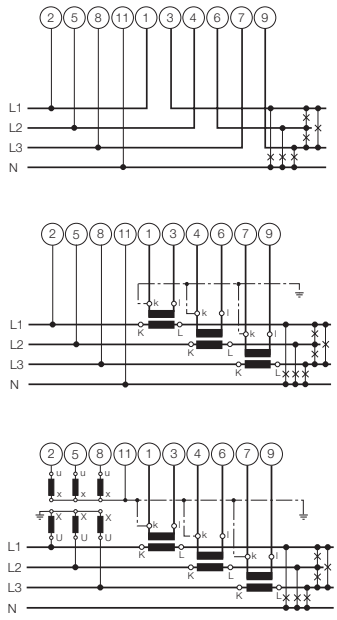

## Connecting modes

| System / application | Terminals |
|---|---|
| **Single-phase** AC system |  |
| **3-wire, 3-phase symmetric load** I: L1 |  |

Connect the voltage according to the following table for current measurement in L2 or L3:

| Current transf. | Terminals | | 2 | 5 | 8 |
|---|---|---|---|---|---|
| L2 | 1 | 3 | L2 | L3 | L1 |
| L3 | 1 | 3 | L3 | L1 | L2 |

# SINEAX A 210/A 220
# Multifunctional Power Monitor

| System / application | Terminals |
|---|---|
| **3-wire** 3 phase **asymmetric load** |  |
| **4-wire** 3 phase **symmetric load** **I: L1** |  Connect the voltage according to the following table for current measurement in L2 or L3: |
| **4-wire** 3 phase **asymmetric load** |  3 single-pole insulated voltage transformers in high-voltage system |

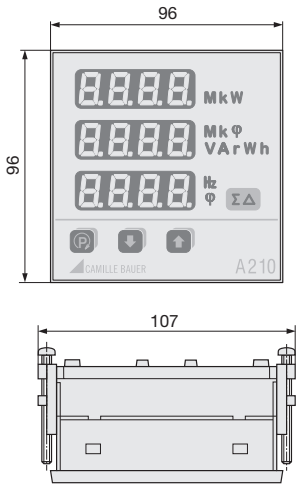
| Current transf. | Terminals | | 2 | 11 |
|---|---|---|---|---|
| L2 | 1 | 3 | L2 | N |
| L3 | 1 | 3 | L3 | N |

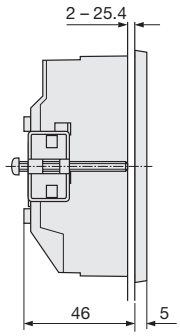
## Maintenance

No maintenance is required.

## Dimensional drawings

### SINEAX A 210

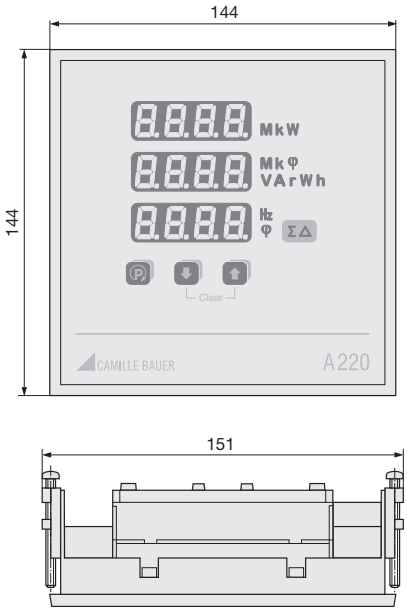


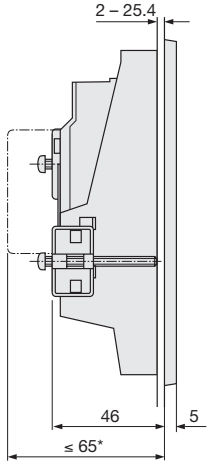




* with extension module

Panel cutout
$92^{+0,8}$ x $92^{+0,8}$ mm

### SINEAX A 220




* with extension module

Panel cutout
$138^{+1}$ x $138^{+1}$ mm

All dimensions in mm.

## Scope of supply

*Basic unit without extension module*
Operating Instructions in German, French and English
Fixing clamp

Measuring protocol at instruments with order No.:
A 210: 150 318, 150 326, 152 710 and 152 728
A 220: 152 562, 152 570, 152 752 and 152 744

## Accessories SINEAX A 210/A 220

| Description | Article No. |
|---|---|
| **Extension module EMMOD 201** Interface/MODBUS RTU/data logger | 150 285 |
| **Top-hat rail adapter** (A 210 only) | 154 055 |
| **Operating Instructions** in German, French and English | 151 118 |

The EMMOD 201 extension module can be plugged in later. It is not necessary to make changes to the basic instrument.

## Extension module EMMOD 201

The EMMOD 201 extension module extends both the functionality and flexibility of the basic A 2.. instruments and supports programming and communication via the RS 232/485 interface (selectable). It supports data communication with a control system with the MODBUS RTU. It can be added without modifying the basic instrument. Memory and a digital input support the supervision and recording of average power values at an interval of 15 minutes for at least 83 days. This function determines the values for the load profile. Alternatively, the digital input can be used for switching between high and low tariff.

The A 200 plus software is required to program the basic A 2.. instrument with a PC and the EMMOD 201, and to read and select the values in memory.

### Power supply

The EMMOD 201 is supplied from the A 2.. basic instrument.

### Communication

| | |
|---|---|
| Interface: | RS 232/RS 485 switchable |
| Protocol: | MODBUS RTU for SCADA |
| Digital input: | Synchronizing input for average power values or switching between high/low tariff for the energy counters |
| Bus interface address: | 1 to 247 |
| Baudrate: | 1200, 2400, 4800, 9600, 19.2 k |
| Parity check: | no, even, odd, space |

### Recording average power values

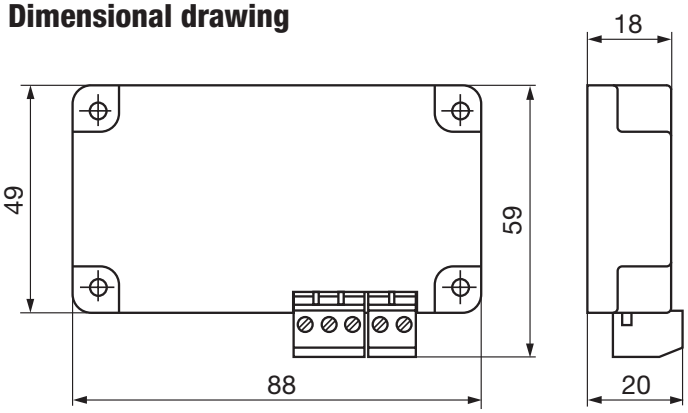
| | |
|---|---|
| Values that can be recorded: | Pint: active power average value with sign (incoming + / outgoing –)<br>Qint: reactive power average value (inductive + / capacitive +) |
| Amount of data at 15 min intervals: | 1 value (Pint or Qint) = 166 days<br>2 values (Pint and Qint) = 83 days |

### Accessories EMMOD 201 (not included in scope of supply)

| Description | Article No. |
|---|---|
| **Software A200 plus** *) | 146 557 |
| **Interface adapter cable** | 152 603 |
| **Extension cable** sub-D 9pol. 2 m | 980 179 |

**) Download free of charge under http://www.camillebauer.com*

## Dimensional drawing



# SINEAX A 210/A 220
# Multifunctional Power Monitor

Subject to change without notice • Edition 08.04 • Data Sheet A 210/A 220 Le

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